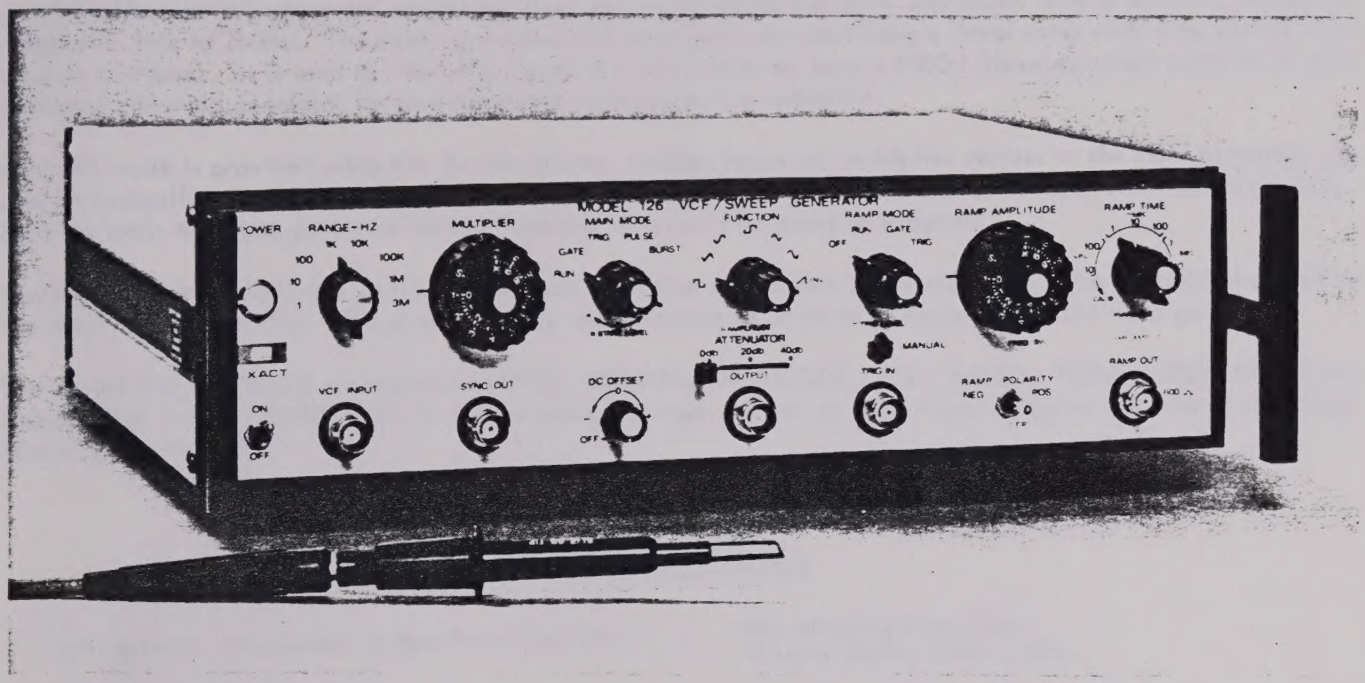
EXACT MODEL 126B

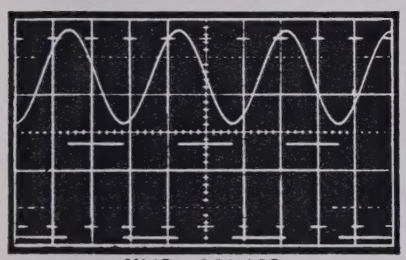
VCF/SWEEP GENERATOR

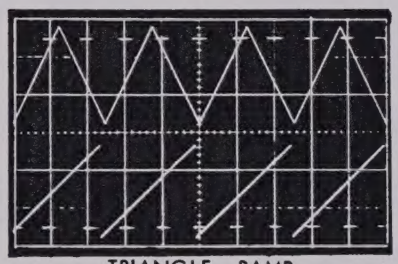
# MODEL 126 VCF/SWEEP GENERATOR

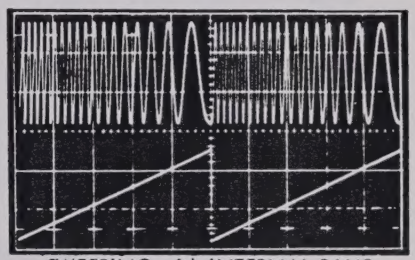


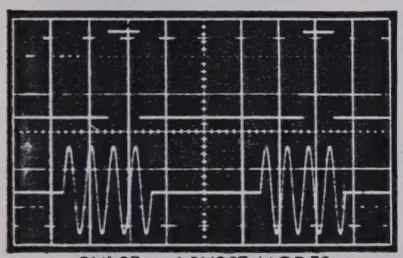

## FEATURES

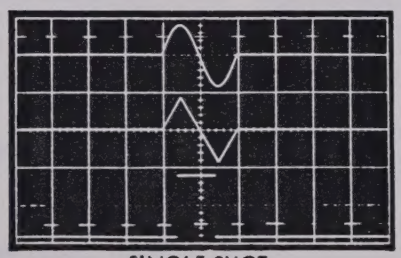
- WAVEFORM GENERATOR - SINE, SQUARE, TRIANGLE, RAMP AND PULSE
- SWEEP GENERATOR (1000:1 RANGE)
- PULSE GENERATOR - VARIABLE WIDTH AND REPETITION RATE
- TONE BURST GENERATOR
- GATE/TRIGGER
- VARIABLE PHASE START/STOP
- KELVIN-VARLEY DIVIDER FREQUENCY CONTROL
- VARIABLE D.C. OFFSET
- SEARCH MODE FOR MANUALLY SWEEPING OVER THREE DECADES
- FLOATING OUTPUT PROVISION
- DB STEP ATTENUATOR

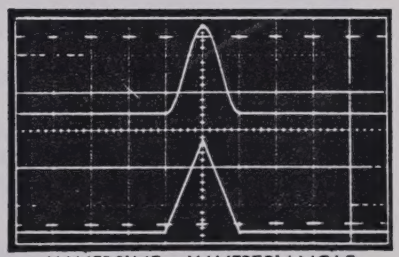

SINE - SQUARE


TRIANGLE - RAMP


SWEEPING with INTERNAL RAMP


PULSE and BURST MODES


SINGLE SHOT


HAVERSINE - HAVERTRIANGLE


® Box 160 Hillsboro, Oregon
97123 Tel. (503) 648-6661
TWX 910-460-8811
EXACT electronics, inc.

A Subsidiary of
Vector Management Corp.

## GENERAL

The Model 126 is two complete generators in one small unique package. The main generator is a VCF (voltage controlled frequency) generator producing sine, square, triangle and sync waveforms over a dynamic frequency range of 0.1Hz to 3MHz. The sweep generator is a ramp generator providing a linear ramp with a duration of 100 seconds to 10μsec. It is used to internally sweep the main generator over a 1000:1 (three decades) range or to gate or trigger the main generator for tone-burst and pulse generator operation.

A search mode is provided using the Kelvin-Varley divider frequency multiplier vernier so the main generator can also be manually swept over three decades. In the pulse mode, pulse duration as well as repetition rate are variable. Both the main and ramp generator can be manually or externally gated or triggered.

The ramp output is available at the ramp output connector via its own attenuator and is also available inverted at the main output amplifier. The main generator can be swept up or down in frequency by the ramp generator.

The Model 126 is actually a combination SINE, SQUARE, TRIANGLE, VCF, SWEEP, TONE BURST, PULSE and independent RAMP GENERATOR in one versatile package, priced at only slightly higher than the Wein Bridge Sine/Square oscillator.

## SPECIFICATIONS

WAVEFORMS: Sine-Square-Triangle-Ramp-Pulse-Sync.

DYNAMIC FREQUENCY RANGE
Main generator, 0.1Hz to 3MHz.
Ramp generator, 100 sec to 10μsec.

MODES OF OPERATION
Main generator: Run-Gate-Trigger-Pulse-Burst-Sweep.
Ramp generator: Off-Run-Gate-Trigger.

SYNC OUTPUT
Main generator: Square wave approx 2V P-P open circuit. Approx 100Ω output impedance.

Ramp generator: Square pulse approx -1V peak open circuit. Approx 100Ω output impedance. Coincident with start of ramp. Located on rear panel.

FREQUENCY ACCURACY
Main generator: ±2% of frequency range (typically ±2% of setting).

Ramp generator: 100 sec to 10μsec in seven calibrated steps. Accurate within ±5%. Uncalibrated, continuously variable between steps.

MAIN OUTPUT: 50Ω output impedance. All waveforms 20V P-P open circuit, 10V P-P into 50Ω with exception of ramp which is 10V peak open circuit, 5V peak into 50Ω. A full 60db of attenuation is provided in 20db steps with 20db continuously variable.

AUXILIARY RAMP OUTPUT: Typically 5V peak into 600Ω, 75Ω output impedance.

GATE AND TRIGGER MODES
Input: D.C. coupled, input impedance approx 5K. Trigger signal requirements; manual or external voltage of approx 500mv for turn on. Trigger level adjustable.

SINE WAVE DISTORTION
<0.5% 0.1Hz to 100KHz (typically 0.2%). No harmonics <30db down 100KHz to 3MHz (typically 38 to 42db down).

SINE FREQUENCY RESPONSE
0.1db to 100KHz, 0.5db to 3MHz.

SQUARE WAVEFORM
Rise and fall <75 nanosec. Overshoot and ringing <5%.

TRIANGLE LINEARITY: 99% to 100KHz, 95% to 3MHz.

D.C. OFFSET: Variable ±5V into 50Ω, ±10V, open circuit. Note D.C. offset plus signal cannot exceed maximum voltage output or clipping will occur.

FREQUENCY STABILITY: 0.05% of setting for 10 min., 0.25% of setting for 24 hrs.

AMPLITUDE STABILITY: 0.05% of max. P-P amplitude for 10 min., 0.25% of max. P-P amplitude for 24 hrs.

SYMMETRY (time): ±1%

POWER REQUIREMENTS
Input Voltage - 115 VAC ±10% or 230 VAC ±10%.
Frequency - 50 to 400Hz.
Power Consumption - approx 20W.

PHYSICAL CHARACTERISTICS
12-1/2" wide X 3-1/2" high X 10-1/2" deep.
Top and bottom covers are easily removable, exposing all calibration and circuit board areas.

PRICE: (f.o.b. Hillsboro, Oregon)

NOTE: (unless otherwise stated). Specifications apply 10% to maximum output voltage, terminated, into 50Ω and do not apply in the Search mode. Specifications are valid at 25° C ±5° C.

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## CHECK-OUT PROCEDURE TO VERIFY SPECIFICATIONS

Following is a list of test equipment required to validate the specifications of the Model 126 VCF/ Sweep Generator.

Test equipment with accuracy equal to the following list of test equipment will be acceptable for specification validation.

Oscilloscope, DC to 50MHz
Plug-in, Differential 20mv/cm sensitivity
Counter/Timer, .1μsec time base
DVM, .01% accuracy
Harmonic Distortion Analyzer, less than 0.1% residual distortion
Spectrum Analyzer, 1KHz to 100MHz

## SPECIFICATIONS

FREQUENCY ACCURACY
Main generator: ±2% of frequency range (typically ±2% of setting).

Ramp generator: 100sec to 10μsec in seven calibrated steps. Accurate within ±5%. Uncalibrated, continuously variable between steps.

MAIN OUTPUT: 50Ω output impedance. All waveforms 20V P-P open circuit, 10V P-P into 50Ω with exception of ramp which is 10V peak open circuit, 5V peak into 50Ω. A full 60db of attenuation is provided in 20db steps with 20db continuously variable.

AUXILIARY RAMP OUTPUT: Typically 5V peak into 600Ω, 75Ω output impedance.

GATE AND TRIGGER MODES: Input D.C. coupled, input impedance approximately 5K. Trigger signal requirements, manual or external voltage of approximately 500mv for turn on. Trigger level adjustable.

SINE WAVE DISTORTION: Less than 0.5% 0.1Hz to 100KHz (typically 0.2%). No harmonics less than 30db down 100KHz to 3MHz (typically 38 to 42db down).

SINE FREQUENCY RESPONSE: 0.1db to 100KHz, 0.5db to 3MHz.

SQUARE WAVEFORM: Rise and fall less than 75 nanoseconds. Overshoot and ringing less than 5%.

TRIANGLE LINEARITY: 99% to 100KHz, 95% to 3MHz.

D.C. OFFSET: Variable ±5V into 50Ω, ±10V, open circuit. Note D.C. offset plus signal cannot exceed maximum voltage output or clipping will occur.

FREQUENCY STABILITY: 0.05% of setting for 10 minutes, 0.25% of setting for 24 hours.

AMPLITUDE STABILITY: 0.05% of maximum P-P amplitude for 10 minutes, 0.25% of maximum P-P amplitude for 24 hours.

SYMMETRY (time): ±1%.

If for any reason the Model 126 VCF/Sweep Generator fails to meet any specifications, it is recommended that the generator be completely calibrated using the Calibration Instructions contained within this manual.

## FREQUENCY ACCURACY

Main Generator:

1. Set controls as follows:

| | |
|---|---|
| RANGE | 1K |
| MULTIPLIER | 1.0 |
| MAIN MODE | RUN |
| FUNCTION | SQUARE |
| ATTENUATOR | 0db |
| AMPLITUDE | MID RANGE |
| D.C. OFFSET | OFF |
| RAMP MODE | RUN |
| RAMP AMPLITUDE | .9X |
| RAMP POLARITY | POS |
| RAMP TIME | 1mSEC |
| CAL VERNIER | CAL |

2. Connect the Counter/Timer to the Sync Output jack on the front panel with an appropriate coaxial cable to the A.C. input.
3. Observe time interval on counter of 1000μsec ±20μsec.
4. Set Range to 100. Observe time interval of 10msec ± .2msec.
5. Set Range to 10. Observe time interval of 100msec ±2msec.
6. Set Range to 1. Observe time interval of 1000msec ±20msec.
7. Set Multiplier to .10. Observe time interval between 8.33sec and 12.50sec.
8. Set Range to 10. Observe time interval between 833msec and 1250msec.
9. Set Range to 100. Observe time interval between 83.3msec and 125msec.
10. Set Range to 1K. Observe time interval between 8.33msec and 12.5msec.
11. Set Range to 10K. Observe frequency of 1KHz ±200Hz.
12. Set Range to 100K. Observe frequency of 10KHz ±2KHz.
13. Set Range to 1M. Observe frequency of 100KHz ±20KHz.
14. Set Range to 3M. Observe frequency of 300KHz ±60KHz.
15. Set Multiplier to 1.0. Observe frequency of 3MHz ±60KHz.

FREQUENCY ACCURACY, Main Generator (continued)

16. Set Range to 1M. Observe frequency of 1MHz ±20KHz.
17. Set Range to 100K. Observe frequency of 100KHz ±2KHz.
18. Set Range to 10K. Observe frequency of 10KHz ±.2KHz.
19. Set Range to 1K. Observe frequency of 1KHz ±20Hz.
20. Set Multiplier to .50. Observe frequency of 500Hz ±20Hz.
21. Set Multiplier to 1.0.

Ramp Generator:

1. Connect the Counter/Timer to the Ramp Sync Output on rear panel with an appropriate coaxial cable.
2. Set counter to read time interval between negative slope and positive slope of pulse.
3. Set Cal vernier to Cal position.
4. Set Ramp Time to 10µsec. Observe ramp time of 10µsec ±.5µsec.
5. Set Ramp Time to 100µsec. Observe ramp time of 100µsec ±5µsec.
6. Set Ramp Time to 1msec. Observe ramp time of 1000µsec ~~±5µsec.~~ ±50 µs
7. Set Ramp Time to 10msec. Observe ramp time of 10msec ±.5msec.
8. Set Ramp Time to 100msec. Observe ramp time of 100msec ±5msec.
9. Set Ramp Time to 1sec. Observe ramp time of 1000msec ±50msec.
10. Set Ramp Time to 10sec. Observe ramp time of 10,000msec ±500msec.
11. Set Range to 1msec.
12. Set Cal vernier full CW. Observe ramp time greater than 10msec.
13. Set Cal vernier to Cal position.

TIME SYMMETRY

1. Connect the Counter/Timer to the Sync output jack on the front panel.
2. Set Range to 10K.

TIME SYMMETRY (continued)

3. Set Multiplier to 1.0
4. Set Counter/Timer to read time interval A to B and B to A. Observe time symmetry error <1%.
5. Set Range to 1K. Observe time symmetry error <1%.
6. Set Range to 100. Observe time symmetry error <1%.
7. Set Range to 10. Observe time symmetry error <1%.
8. Set Range to 1. Observe time symmetry error <1%.
9. Set Multiplier to .10. Observe time symmetry error <1%.
10. Set Range to 1K
11. Set Multiplier to 1.0.

FREQUENCY STABILITY

1. Observe that the frequency remains within 0.05% for 10 minutes or ±.5μsec.

SYNC OUTPUT

1. Connect oscilloscope to the Sync output on front panel with an appropriate coaxial lead.
2. Observe square wave of approximately 2V P-P open circuit.
3. Connect oscilloscope to the Ramp Sync output on rear panel.
4. Observe Sync pulse approximately -1V peak open circuit.

MAIN OUTPUT

1. Set Amplitude to Max. Connect the main output to the oscilloscope with a 50Ω coaxial cable terminated into 50Ω.
2. Observe square wave >10V P-P.
3. Switch through all square, triangle and sine waveforms, observing >10V P-P amplitude.
4. Switch to Ramp waveform. Set Ramp Amp. .9X. Observe >5V ramp on Pos or Neg Ramp as selected by Ramp Polarity switch.

MAIN OUTPUT (continued)

5. Remove 50Ω terminator and observe >20V P-P open circuit for square, triangle and sine waveforms and >10V peak for positive and negative ramp.

6. Set Attenuator at 20db and observe amplitude drops 20db or to 1/10 of amplitude at 0db.

7. Set Attenuator at 40db and observe amplitude drops another 20db, or to 1/100 of amplitude at 0db.

8. Rotate Amplitude vernier and observe another 20db of attenuation.

9. Set Amplitude to Max, Attenuator to 0db.

AUXILIARY RAMP OUTPUT

1. Connect the Ramp output jack through an appropriate coaxial cable terminated into 600Ω to the oscilloscope.

2. Observe positive ramp waveform > 5V peak into 600Ω.

3. Set Ramp Polarity to Neg and observe negative ramp > 5V peak into 600Ω.

GATE AND TRIGGER MODES

1. Set

| | |
|---|---|
| MAIN MODE | GATE |
| RAMP MODE | GATE |
| TRIG LEVEL | MAX |

2. Monitor the Main output with oscilloscope.

3. Apply signal at Trig input jack, increase signal and observe Main generator runs at approximately +500mv of signal.

4. Monitor Ramp output and observe ramp runs at approx. +500mv of signal.

SINE WAVE DISTORTION

1. Set

| | |
|---|---|
| MAIN MODE | RUN |
| RANGE | 10K |
| AMP | MID RANGE |
| FUNCTION | SINE |

SINE WAVE DISTORTION (continued)

2. Connect distortion analyzer to the Main output jack. Measure sine distortion of <.5%, typically .20%.

3. Set Range to 100K and measure sine distortion <.5%.

4 ~~Set Range to 3M~~ Connect ~~spectrum analyzer to Main output jack and measure harmonic content~~ ~~Observe no harmonics~~ ~~<30db down~~.

SINE FREQUENCY RESPONSE

1. Set Range to 10K.

2. Connect oscilloscope to Main output jack.

3. Measure sine wave P-P amplitude accurately.

4. Set Range to 100K. Observe sine amplitude drop <.1db.

5. Set Range to 3M. Observe sine amplitude drop <.5db.

SQUARE WAVEFORM

1. Set

| | |
|---|---|
| RANGE | 1M |
| FUNCTION | SQUARE |

2. Connect the Main output through a 50Ω coaxial cable terminated into 50Ω to the oscilloscope.

3. Observe risetime and falltime of square <75ns at Main output.

4. Observe overshoot and ringing <5% of P-P amplitude.

D.C. OFFSET

1. Set Range to 1K, Amplitude vernier to Min.

2. Rotate D.C. offset switch and observe D.C. level shift ±5V into 50Ω.

3. Remove terminator and observe D.C. level shift ±10V.

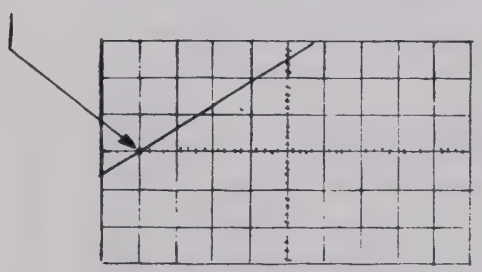
NOTE: D.C. offset plus signal cannot exceed maximum voltage output or clipping will occur.

## AMPLITUDE STABILITY

1. Set Amplitude to Max, D.C. Offset to Off, Function to Triangle.
2. Connect the Main output through a 50Ω coaxial cable terminated into 50Ω.
3. Set plug-in sensitivity to 20mv/cm.
4. Measure accurately the positive peak of triangle and negative peak of triangle and record.
5. Wait 10 minutes and measure positive and negative peaks again. Observe amplitude change <10mv.

## TRIANGLE LINEARITY

1. Connect the Main output to the differential plug-in through a 50Ω coaxial cable terminated into 50Ω.
2. Adjust oscilloscope to obtain one-half cycle of triangle across full horizontal grid on oscilloscope CRT.
3. Set differential plug-in sensitivity at 20mv/cm.
4. Adjust comparison voltage until the slope of the triangle waveform intersects the mid-scale horizontal grid line at the second major mark as shown below.



5. Record reference voltage using DVM accurate to 1mv.
6. Adjust comparison voltage until slope of triangle intersects next major horizontal grid mark.
7. Record accurately the new reference voltage.
8. Repeat to obtain as many points as desired.
9. Calculate linearity and observe linearity is 99% or better.

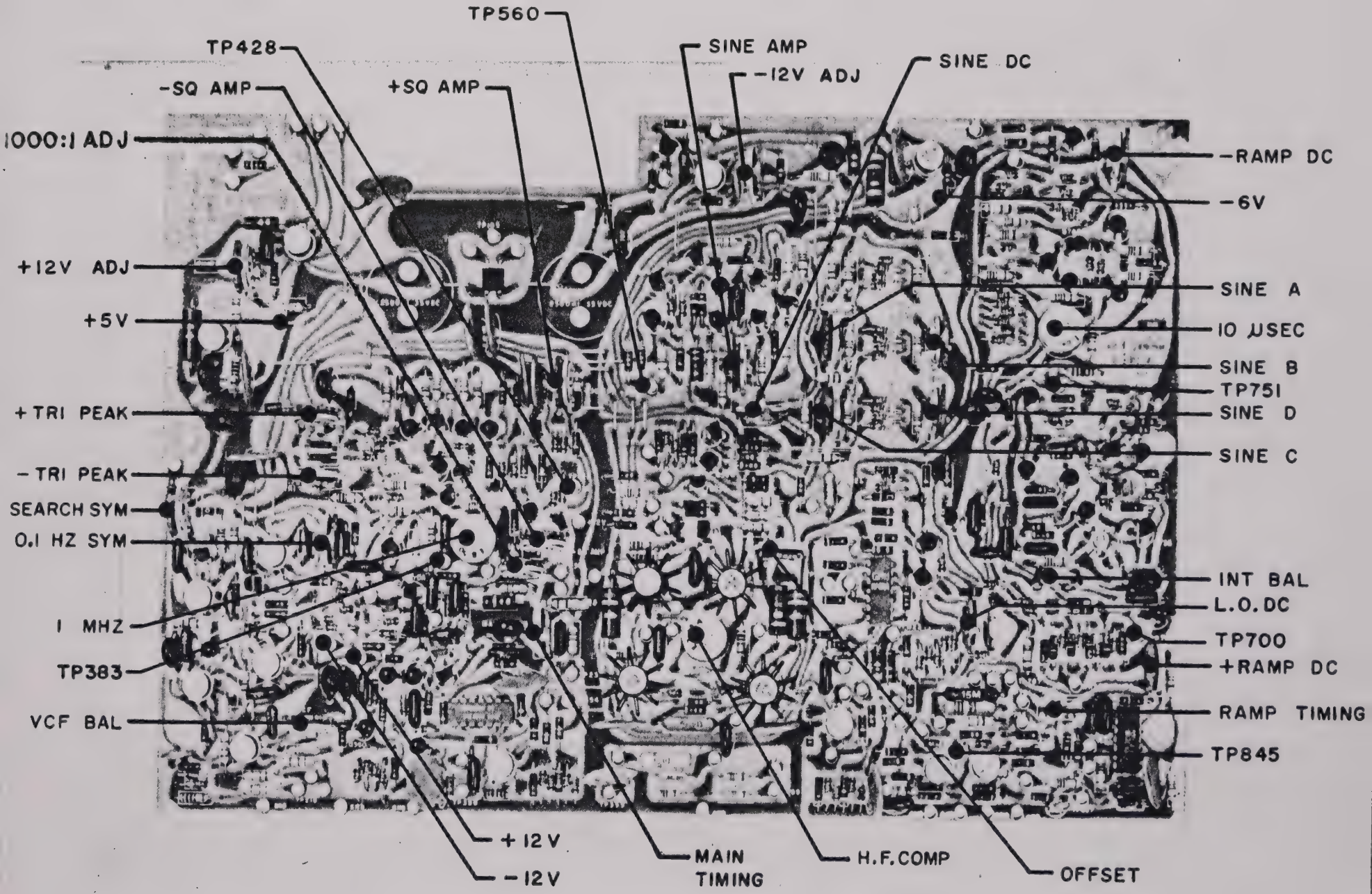



FIG. 5.3.1 MODEL 126 ADJUSTMENTS & TEST POINTS

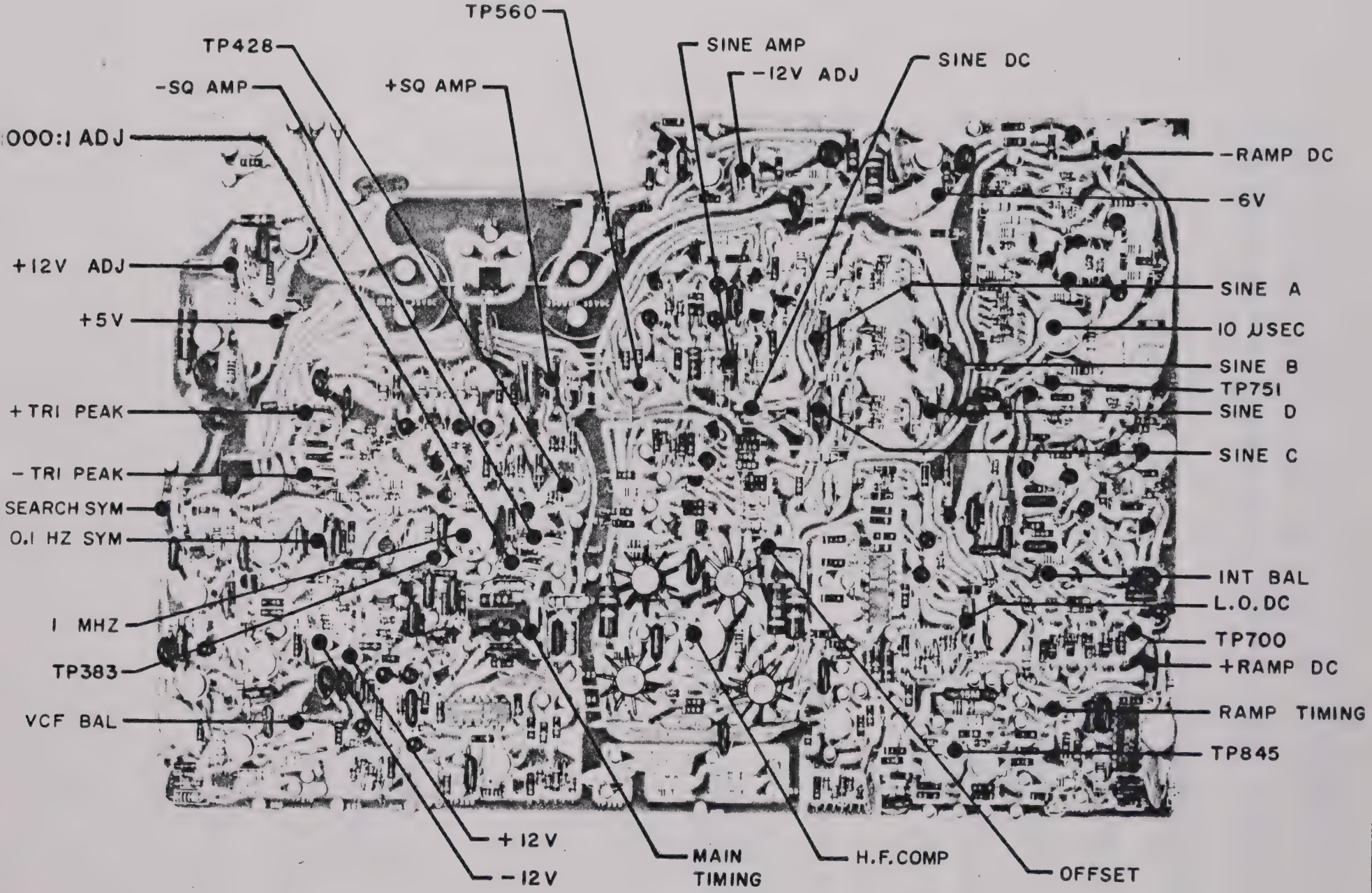



FIG. 5.3.1 MODEL 126 ADJUSTMENTS & TEST POINTS

# SECTION 5 CALIBRATION

## 5.1.0 EQUIPMENT REQUIRED

The following test equipment or suitable equivalents of known accuracy are required for complete calibration of the Model 126 VCF/Sweep Generator.

Oscilloscope - D.C. to 50MHz. Differential plug-in with 10mv resolution.
Distortion Analyzer
Variable Transformer
Variable Regulated Power Supply - 1mv resolution
Frequency Counter/Time Interval Counter
Differential Voltmeter - 0.01% accuracy

## 5.2.0 INITIAL CONTROL SETTINGS

| | |
|---|---|
| POWER SWITCH | ON |
| RANGE | 1K |
| MULTIPLIER | 1.0 |
| MAIN MODE | RUN |
| FUNCTION | ∿ |
| AMPLITUDE | MAX |
| ATTENUATOR | 0db |
| D.C. OFFSET | OFF |
| RAMP MODE | RUN |
| RAMP AMPLITUDE | .9X |
| RAMP POLARITY | NEG |
| RAMP TIME | 1mSEC |

## 5.3.0 CALIBRATION PROCEDURE

### 5.3.1 Main Generator

+12V Adjust - Connect voltmeter from +12V to ground. Adjust +12V Adj for +12V ±5mv.

-12V Adjust - Connect voltmeter from -12V to ground. Adjust -12V for -12V ±5mv.

VCF Balance Adjust - Connect frequency counter to sync out jack. Adjust VCF balance until there is no frequency shift on frequency counter when VCF input is grounded.

±Triangle Peak Adjust - Using differential plug-in, adjust +Tri Peak and -Tri Peak to obtain ±1.25V peak ±10mv at TP383.

Main Timing Adjust - Adjust Main Timing to obtain 1KHz ± .5% at Sync output jack as observed on frequency counter.

1000:1 Adjust - Set Range to 100K, Multiplier to S0. Monitor main output with oscilloscope and adjust 1000:1 adjust to obtain 100Hz triangle as indicated on frequency counter.

Search Symmetry Adjust - Set Range to 100K, Multiplier to S 0. Monitor Main output with oscilloscope and adjust Search Symmetry to obtain symmetrical waveform. Check for proper adjustment using time interval counter connected at the Sync Output jack.

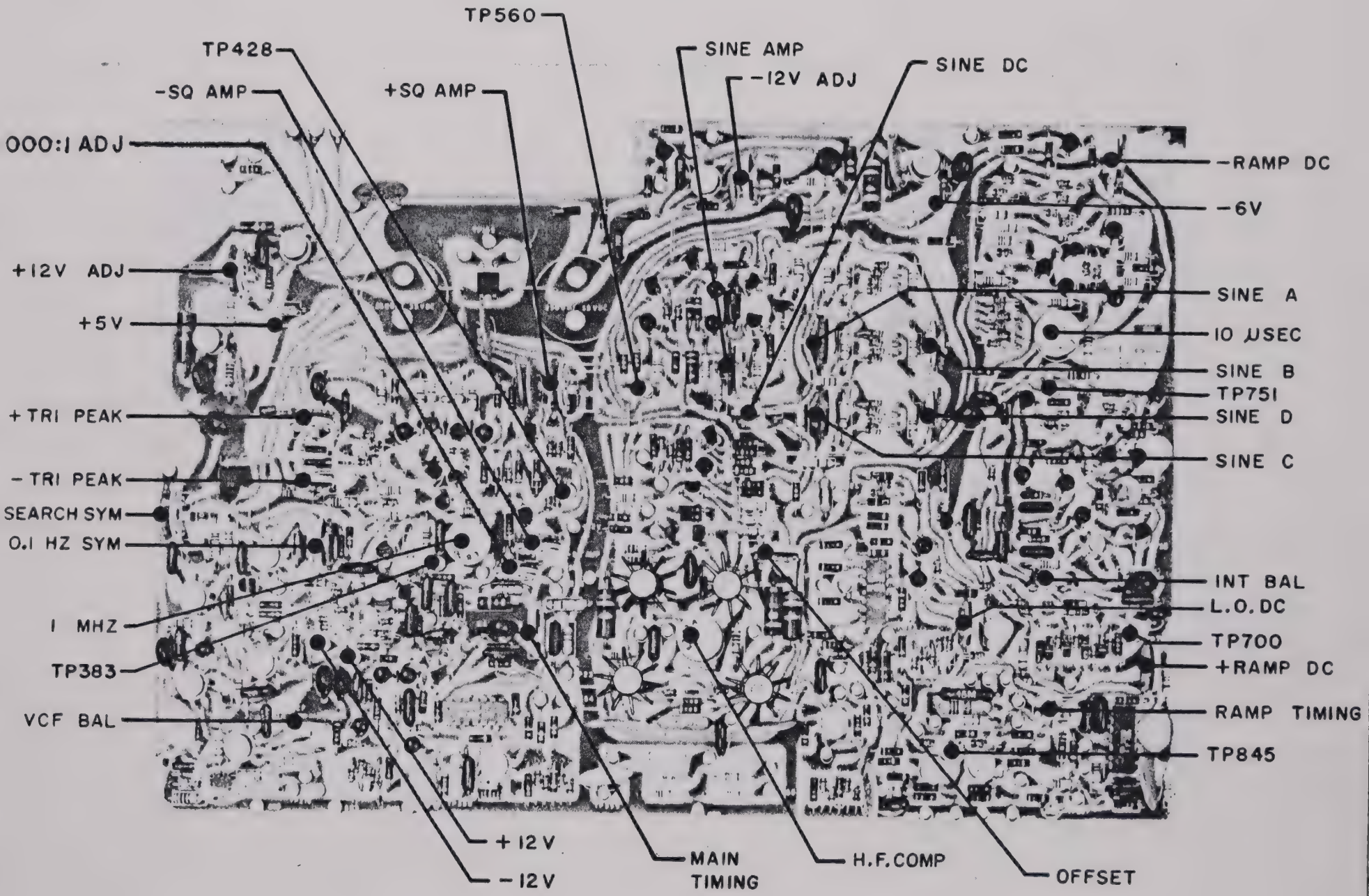



FIG. 5.3.1 MODEL 126 ADJUSTMENTS & TEST POINTS

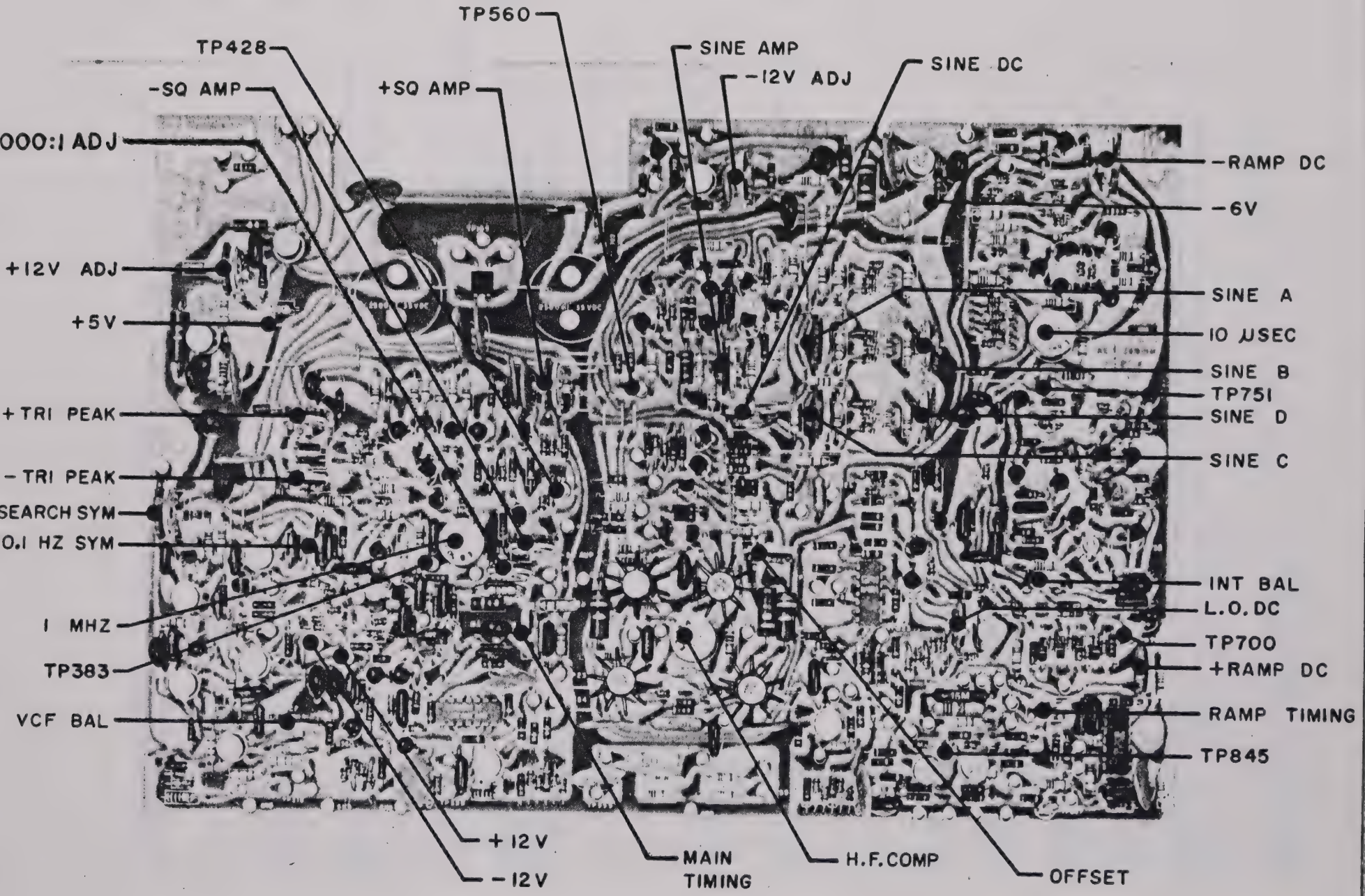



FIG. 5.3.1 MODEL 126 ADJUSTMENTS & TEST POINTS

0.1Hz Symmetry Adjust - Set Range to 1, Multiplier to .10. Connect time interval counter to the Sync Output jack and adjust 0.1Hz Sym for correct symmetry ±.5%.

Repeat 1000:1 Adjust, Search Symmetry and 0.1Hz Symmetry adjustments.

1MHz Timing Adjust - Set Range to 1M, Multiplier to 1.0. Connect frequency counter to Sync Output jack. Adjust 1MHz trimmer to obtain 1MHz ±1% as indicated on frequency counter.

3MHz Timing Adjust - Set Range to 3M, Multiplier to 1.0. Connect frequency counter to the Sync Output jack. Adjust 3MHz trimmer mounted on Range switch to obtain 3MHz ±1% on frequency counter.

±Square Amplitude Adjust - Set Range to 1K, Function to Square. Using differential plug-in adjust +Square Amp and -Square Amp to obtain ±1.25V peak ±10mv square wave at TP428.

Offset Adjust - Set Range to 1K, Multiplier to 1.0 and Amplitude to minimum (full CCW). Monitor Main output with oscilloscope and adjust offset to obtain minimum offset while switching between the Normal triangle and Inverted triangle with Function switch.

H.F. Comp Adjust - Set Range to 1M, Multiplier to 1.0, Function to Square, Amplitude to Max. Terminate the Main output into 50Ω and monitor with oscilloscope. Adjust H.F. Comp to obtain optimum square wave with minimum overshoot.

Sine A, B, C, D Adjust - Set Range to 10K, Multiplier to 1.0 and Function to Sine. Connect distortion analyzer to Main Output jack. Adjust Sine A, B, C and D to obtain minimum sine distortion, typically less than 0.25%.

Sine Amplitude - Sine D.C. Adjust - Connect differential plug-in to TP560. Adjust Sine Amp and Sine D.C. to obtain ±1.25V peak ±10mv.

Repeat previous two steps due to interaction.

5.3.2 Ramp Generator

Internal Balance Adjust - Set Ramp Mode to Gate. Connect differential voltmeter to TP700 and adjust Int Bal to obtain 0V ±2mv at TP700.

Lockout D.C. Adjust - Set Ramp Mode to Gate, Ramp Polarity to Negative. Connect differential voltmeter to TP845 and adjust L.O D.C. to obtain 0V ±2mv.

+Ramp D.C. Adjust - Set Ramp Polarity to Positive. Adjust +Ramp D.C. to obtain 0V ±10mv at TP845.

-Ramp D.C. Adjust - Set Ramp Mode to Run, Ramp Time to 1msec. Adjust -Ramp D.C. until positive peak of ramp is 0V ±10mv at TP751.

Ramp Timing Adjust - Set Ramp Mode to Run, Ramp Time to 1msec, variable to Cal. Connect time interval counter to ramp sync jack on rear panel. Measure time interval - to +. Adjust Ramp timing to obtain 1msec ±1%.

10µsec Adjust - Set Ramp time to 10µsec. Adjust 10µsec trimmer to obtain 10µsec ±2% as indicated on time interval counter.

3.2.0 FIRST TIME OPERATION (continued)

1. Connect the Main output through a 50Ω coaxial cable into a 50Ω terminator to a suitable oscilloscope. A 1KHz 10V P-P triangle waveform should be observed under these conditions.

2. Switch the Function switch through its various output waveforms.

3. The frequency may be selected by the Range switch and/or the Multiplier dial.

4. Switch the D.C. Offset switch On and observe the waveform D.C. level may be adjusted as desired. Set the D.C. offset switch to the Off position.

5. Observe the output amplitude can be adjusted over its 60db of dynamic range by the Amplitude Vernier and the Attenuator switch.

6. Place the Main Mode switch in the Gate position. Observe the Main generator is now locked out. Observe the output while depressing the Manual pushbutton. The generator will free run as long as the pushbutton is depressed.

7. Rotate the Start Level vernier and observe the lockout level may be adjusted to the desired level or phase.

NOTE: The generator will free run if the Start Level is rotated too far.

8. Set the Main Mode switch to the Trig position. Observe one complete cycle each time the manual pushbutton is depressed.

9. Pulse Mode

Set the Main Mode switch to Pulse. The generator is now being triggered by the ramp generator, giving a pulse output.

Set controls as follows

| | |
|---|---|
| FUNCTION | SQUARE |
| RANGE | 1K |
| MULTIPLIER | 1.0 |
| RAMP MODE | RUN |
| RAMP AMPLITUDE | .10 |
| RAMP TIME | 10msec |
| | |
| OSCILLOSCOPE | 2msec/cm |

Trigger scope from front panel Sync output.

Observe that the Main generator Range and Multiplier controls vary the pulse width. The repetition rate is variable by varying the ramp time and ramp amplitude.

3.2.0 FIRST TIME OPERATION (continued)

10. Burst Mode

Place the Main Mode switch to Burst. The Main generator is now being gated by the ramp generator, giving a burst output.

Set the generator controls as follows

| | |
|---|---|
| FUNCTION | SINE |
| RANGE | 1K |
| MULTIPLIER | 1.0 |
| RAMP MODE | RUN |
| RAMP AMPLITUDE | .10 |
| RAMP TIME | 10msec |
| OSCILLOSCOPE | 2msec/cm |

Trigger scope from front panel Sync output.

Observe by adjusting the Ramp Amplitude or Ramp Time the burst "on" and "off" time may be varied. The frequency of the Main generator determines the frequency within the burst.

Caution: If the ramp amplitude is adjusted below .06 (600mv), the Main generator will lock out. Also, if the ramp amplitude is adjusted beyond .50 the generator may appear to be free running unless properly synchronized to the scope, since the "off" time is very small in proportion to the "on" time.

If the ramp amplitude is adjusted beyond .30, it is recommended that the Ramp Sync output (located on rear panel) be used to trigger the scope while observing the burst "off" time.

11. Sweep Mode

To thoroughly understand the Sweep mode it is recommended that you read the circuit description under section 4.2.1 (Summing Amplifier).

Set Ramp Amp to .9X. Place Main Mode to Sweep, Ramp Polarity to Neg and Ramp Time to 1sec. The Main generator frequency is now being swept down over 1000:1 by the Ramp generator at the rate set by the Ramp Time switch.

Place the Main Mode switch to Run. Place the Multiplier to S. Set the Range switch to 100K. While rotating the Multiplier vernier CCW toward 0, observe the Main generator frequency will sweep down to 1/1000 of the frequency set by the Range switch.

Set Ramp Polarity to Pos, set Main Mode to Sweep. Observe the Main generator frequency is now being swept up in frequency from 1/1000 of the range setting to approximately that of the range setting.

(for EXAC 126B VCF / Sweeper

# CALIBRATION PROCEDURE

## EQUIPMENT REQUIRED

THE FOLLOWING TEST EQUIPMENT OR SUITABLE EQUIVALENTS OF KNOWN ACCURACY ARE REQUIRED FOR COMPLETE CALIBRATION.

OSCILLOSCOPE - DC TO 50MHz. DIFFERENTIAL PLUG-IN WITH 10mv RESOLUTION.
DISTORTION ANALYZER
VARIABLE TRANSFORMER
VARIABLE REGULATED POWER SUPPLY - 1mv RESOLUTION
FREQUENCY COUNTER/TIME INTERVAL COUNTER
DIFFERENTIAL VOLTMETER - 0.01% ACCURACY

## INITIAL CONTROL SETTINGS

| | |
|---|---|
| POWER SWITCH | ON |
| RANGE | 1K |
| MULTIPLIER | 1.0 |
| MAIN MODE | RUN |
| FUNCTION | ∿ |
| AMPLITUDE | MAX |
| ATTENUATOR | 0db |
| D.C. OFFSET | OFF |
| RAMP MODE | RUN |
| RAMP AMPLITUDE | .9X |
| RAMP POLARITY | NEG |
| RAMP TIME | 1mSEC |

## MAIN GENERATOR

+12V ADJUST - CONNECT VOLTMETER FROM +12V TO GROUND. ADJUST +12V ADJ FOR +12V ±5mv.

-12V ADJUST - CONNECT VOLTMETER FROM -12V TO GROUND. ADJUST -12V ADJ FOR -12V ±5mv.

VCF BALANCE ADJUST - CONNECT FREQUENCY COUNTER TO SYNC OUT JACK. ADJUST VCF BALANCE UNTIL THERE IS NO FREQUENCY SHIFT ON FREQUENCY COUNTER WHEN VCF INPUT IS GROUNDED.

±TRIANGLE PEAK ADJUST - USING DIFFERENTIAL PLUG-IN, ADJUST +TRI PEAK AND -TRI PEAK TO OBTAIN ±1.25V PEAK ±10mv AT TP383.

MAIN TIMING ADJUST - ADJUST MAIN TIMING TO OBTAIN 1KHz ±.5% AT SYNC OUTPUT JACK AS OBSERVED ON FREQUENCY COUNTER.

1000:1 ADJ - SET RANGE TO 100K, MULTIPLIER TO S.O. MONITOR MAIN OUTPUT WITH OSC.AND ADJUST 1000:1 ADJ TO OBTAIN 100Hz TRI AS INDICATED ON FREQ COUNTER.

SEARCH SYMMETRY ADJUST - SET RANGE TO 100K, MULTIPLIER TO S.O. MONITOR MAIN OUTPUT WITH OSC.AND ADJUST SEARCH SYMMETRY TO OBTAIN SYMMETRICAL WAVEFORM. CHECK FOR PROPER ADJUSTMENT USING TIME INTERVAL COUNTER CONNECTED AT THE SYNC OUTPUT JACK.

0.1Hz SYMMETRY ADJUST - SET RANGE TO 1, MULTIPLIER TO .10. CONNECT TIME INTERVAL COUNTER TO SYNC OUTPUT JACK AND ADJUST 0.1Hz SYM FOR CORRECT SYMMETRY ±.5%.

REPEAT 1000:1 ADJUST, SEARCH SYMMETRY AND 0.1Hz SYM ADJ.

1MHz TIMING ADJUST - SET RANGE TO 1M, MULTIPLIER TO 1.0. CONNECT FREQUENCY COUNTER TO SYNC OUTPUT JACK. ADJUST 1MHz TRIMMER TO OBTAIN 1MHz ±1% AS INDICATED ON FREQUENCY COUNTER.

3MHz TIMING ADJUST - SET RANGE TO 3M, MULTIPLIER TO 1.0. CONNECT FREQUENCY COUNTER TO SYNC OUTPUT JACK. ADJUST 3MHz TRIMMER MOUNTED ON RANGE SWITCH TO OBTAIN 3MHz ±1% ON FREQUENCY COUNTER.

±SQUARE AMPLITUDE ADJUST - SET RANGE TO 1K, FUNCTION TO SQUARE. USING DIFFERENTIAL PLUG-IN, ADJUST +SQUARE AMP AND -SQUARE AMP TO OBTAIN ±1.25V PEAK ±10mv SQUARE WAVE AT TP428.

OFFSET ADJUST - SET RANGE TO 1K, MULTIPLIER TO 1.0 AND AMP TO MIN (FULL CCW). MONITOR MAIN OUTPUT WITH OSC.AND ADJUST OFFSET TO OBTAIN MIN.OFFSET WHILE SWITCHING BETWEEN THE NORMAL TRIANGLE AND INVERTED TRIANGLE WITH FUNCTION SWITCH.

H.F. COMP ADJUST - SET RANGE TO 1M, MULTIPLIER TO 1.0, FUNCTION TO SQUARE, AMP TO MAX. TERMINATE THE MAIN OUTPUT INTO 50Ω AND MONITOR WITH OSC. ADJUST H.F. COMP TO OBTAIN OPTIMUM SQUARE WAVE WITH MINIMUM OVERSHOOT.

SINE A, B, C, D ADJUST - SET RANGE TO 10K, MULTIPLIER TO 1.0 AND FUNCTION TO SINE. CONNECT DISTORTION ANALYZER TO MAIN OUTPUT JACK. ADJUST SINE A, B, C AND D TO OBTAIN MIN SINE DISTORTION, TYPICALLY LESS THAN 0.25%.

SINE AMP - SINE D.C. ADJUST - CONNECT DIFFERENTIAL PLUG-IN TO TP560. ADJUST SINE AMP AND SINE D.C. TO OBTAIN ±1.25V PEAK ±10mv.

REPEAT PREVIOUS TWO STEPS DUE TO INTERACTION.

## RAMP GENERATOR

INTERNAL BALANCE ADJUST - SET RAMP MODE TO GATE. CONNECT DIFFERENTIAL VOLTMETER TO TP700 AND ADJUST INTERNAL BALANCE TO OBTAIN 0V ±2mv AT TP700.

LOCKOUT D.C. ADJUST - SET RAMP MODE TO GATE, RAMP POLARITY TO NEG. CONNECT DIFFERENTIAL VOLTMETER TO TP845 AND ADJUST L.O.D.C. TO OBTAIN 0V ±2mv.

+RAMP D.C. ADJUST - SET RAMP POLARITY TO POS. ADJUST +RAMP D.C. TO OBTAIN 0V ±10mv AT TP845.

-RAMP D.C. ADJUST - SET RAMP MODE TO RUN, RAMP TIME TO 1mSEC. ADJUST -RAMP D.C. UNTIL POS PEAK OF RAMP IS 0V ±10mv AT TP751.

RAMP TIMING ADJUST - SET RAMP MODE TO RUN, RAMP TIME TO 1mSEC, VAR TO CAL. CONNECT TIME INTERVAL COUNTER TO RAMP SYNC JACK ON REAR PANEL. MEASURE TIME INTERVAL - TO +. ADJUST RAMP TIMING TO OBTAIN 1mSEC ±1%.

10μSEC ADJUST - SET RAMP TIME TO 10μSEC. ADJUST 10μSEC TRIMMER TO OBTAIN 10μSEC ±2% AS INDICATED ON TIME INTERVAL COUNTER.

## LOG AMPLIFIER (Model 128 only)

| | | |
|---|---|---|
| SET: | RANGE | 1K |
| | MULT | 1.0 |
| | MAIN MODE | RUN |
| | LIN/LOG SW | LIN |

CHECK FOR ±4V AND ±6V ±250mv.

AMP 1 BAL - GROUND TP960 AND ADJUST AMP 1 BAL TO OBTAIN 0V AT TP970. REMOVE JUMPER.

ORIGIN - SET MULT TO S.X. SWITCH TO LOG MODE AND ADJUST ORIGIN TO OBTAIN 2.90V AT TP960.

AMP 2 BAL - GROUND TP960 AND ADJUST AMP 2 BAL FOR 0V AT OUTPUT TERMINAL. REMOVE JUMPER.

LOG MODE TIMING - ADJUST LOG MODE TIMING TO OBTAIN SAME FREQUENCY AS IN LINEAR MODE.

AMP 3 BAL - SET MULT TO S.O (100Hz), LIN/LOG SWITCH TO LOG. ADJUST AMP 3 BAL TO OBTAIN 5mv AT V:f OUTPUT TERMINAL.

# CALIBRATION PROCEDURE

## EQUIPMENT REQUIRED

THE FOLLOWING TEST EQUIPMENT OR SUITABLE EQUIVALENTS OF KNOWN ACCURACY ARE REQUIRED FOR COMPLETE CALIBRATION.

OSCILLOSCOPE - DC TO 50MHz. DIFFERENTIAL PLUG-IN WITH 10mv RESOLUTION.
DISTORTION ANALYZER
VARIABLE TRANSFORMER
VARIABLE REGULATED POWER SUPPLY - 1mv RESOLUTION
FREQUENCY COUNTER/TIME INTERVAL COUNTER
DIFFERENTIAL VOLTMETER - 0.01% ACCURACY

## INITIAL CONTROL SETTINGS

| | |
|---|---|
| POWER SWITCH | ON |
| RANGE | 1K |
| MULTIPLIER | 1.0 |
| MAIN MODE | RUN |
| FUNCTION | ∿ |
| AMPLITUDE | MAX |
| ATTENUATOR | 0db |
| D.C. OFFSET | OFF |
| RAMP MODE | RUN |
| RAMP AMPLITUDE | .9X |
| RAMP POLARITY | NEG |
| RAMP TIME | 1mSEC |

## MAIN GENERATOR

+12V ADJUST - CONNECT VOLTMETER FROM +12V TO GROUND. ADJUST +12V ADJ FOR +12V ±5mv.

-12V ADJUST - CONNECT VOLTMETER FROM -12V TO GROUND. ADJUST -12V ADJ FOR -12V ±5mv.

VCF BALANCE ADJUST - CONNECT FREQUENCY COUNTER TO SYNC OUT JACK. ADJUST VCF BALANCE UNTIL THERE IS NO FREQUENCY SHIFT ON FREQUENCY COUNTER WHEN VCF INPUT IS GROUNDED.

±TRIANGLE PEAK ADJUST - USING DIFFERENTIAL PLUG-IN, ADJUST +TRI PEAK AND -TRI PEAK TO OBTAIN ±1.25V PEAK ±10mv AT TP383.

MAIN TIMING ADJUST - ADJUST MAIN TIMING TO OBTAIN 1KHz ±.5% AT SYNC OUTPUT JACK AS OBSERVED ON FREQUENCY COUNTER.

1000:1 ADJ - SET RANGE TO 100K, MULTIPLIER TO S.O. MONITOR MAIN OUTPUT WITH OSC.AND ADJUST 1000:1 ADJ TO OBTAIN 100Hz TRI AS INDICATED ON FREQ COUNTER.

SEARCH SYMMETRY ADJUST - SET RANGE TO 100K, MULTIPLIER TO S.O. MONITOR MAIN OUTPUT WITH OSC.AND ADJUST SEARCH SYMMETRY TO OBTAIN SYMMETRICAL WAVEFORM. CHECK FOR PROPER ADJUSTMENT USING TIME INTERVAL COUNTER CONNECTED AT THE SYNC OUTPUT JACK.

0.1Hz SYMMETRY ADJUST - SET RANGE TO 1, MULTIPLIER TO .10. CONNECT TIME INTERVAL COUNTER TO SYNC OUTPUT JACK AND ADJUST 0.1Hz SYM FOR CORRECT SYMMETRY ±.5%.

REPEAT 1000:1 ADJUST, SEARCH SYMMETRY AND 0.1Hz SYM ADJ.

1MHz TIMING ADJUST - SET RANGE TO 1M, MULTIPLIER TO 1.0. CONNECT FREQUENCY COUNTER TO SYNC OUTPUT JACK. ADJUST 1MHz TRIMMER TO OBTAIN 1MHz ±1% AS INDICATED ON FREQUENCY COUNTER.

3MHz TIMING ADJUST - SET RANGE TO 3M, MULTIPLIER TO 1.0. CONNECT FREQUENCY COUNTER TO SYNC OUTPUT JACK. ADJUST 3MHz TRIMMER MOUNTED ON RANGE SWITCH TO OBTAIN 3MHz ±1% ON FREQUENCY COUNTER.

±SQUARE AMPLITUDE ADJUST - SET RANGE TO 1K, FUNCTION TO SQUARE. USING DIFFERENTIAL PLUG-IN, ADJUST +SQUARE AMP AND -SQUARE AMP TO OBTAIN ±1.25V PEAK ±10mv SQUARE WAVE AT TP428.

OFFSET ADJUST - SET RANGE TO 1K, MULTIPLIER TO 1.0 AND AMP TO MIN (FULL CCW). MONITOR MAIN OUTPUT WITH OSC.AND ADJUST OFFSET TO OBTAIN MIN.OFFSET WHILE SWITCHING BETWEEN THE NORMAL TRIANGLE AND INVERTED TRIANGLE WITH FUNCTION SWITCH.

H.F. COMP ADJUST - SET RANGE TO 1M, MULTIPLIER TO 1.0, FUNCTION TO SQUARE, AMP TO MAX. TERMINATE THE MAIN OUTPUT INTO 50Ω AND MONITOR WITH OSC. ADJUST H.F. COMP TO OBTAIN OPTIMUM SQUARE WAVE WITH MINIMUM OVERSHOOT.

SINE A, B, C, D ADJUST - SET RANGE TO 10K, MULTIPLIER TO 1.0 AND FUNCTION TO SINE. CONNECT DISTORTION ANALYZER TO MAIN OUTPUT JACK. ADJUST SINE A, B, C AND D TO OBTAIN MIN SINE DISTORTION, TYPICALLY LESS THAN 0.25%.

SINE AMP - SINE D.C. ADJUST - CONNECT DIFFERENTIAL PLUG-IN TO TP560. ADJUST SINE AMP AND SINE D.C. TO OBTAIN ±1.25V PEAK ±10mv.

REPEAT PREVIOUS TWO STEPS DUE TO INTERACTION.

## RAMP GENERATOR

INTERNAL BALANCE ADJUST - SET RAMP MODE TO GATE. CONNECT DIFFERENTIAL VOLTMETER TO TP700 AND ADJUST INTERNAL BALANCE TO OBTAIN 0V ±2mv AT TP700.

LOCKOUT D.C. ADJUST - SET RAMP MODE TO GATE, RAMP POLARITY TO NEG. CONNECT DIFFERENTIAL VOLTMETER TO TP845 AND ADJUST L.O.D.C. TO OBTAIN 0V ±2mv.

+RAMP D.C. ADJUST - SET RAMP POLARITY TO POS. ADJUST +RAMP D.C. TO OBTAIN 0V ±10mv AT TP845.

-RAMP D.C. ADJUST - SET RAMP MODE TO RUN, RAMP TIME TO 1mSEC. ADJUST -RAMP D.C. UNTIL POS PEAK OF RAMP IS 0V ±10mv AT TP751.

RAMP TIMING ADJUST - SET RAMP MODE TO RUN, RAMP TIME TO 1mSEC, VAR TO CAL. CONNECT TIME INTERVAL COUNTER TO RAMP SYNC JACK ON REAR PANEL. MEASURE TIME INTERVAL - TO +. ADJUST RAMP TIMING TO OBTAIN 1mSEC ±1%.

10μSEC ADJUST - SET RAMP TIME TO 10μSEC. ADJUST 10μSEC TRIMMER TO OBTAIN 10μSEC ±2% AS INDICATED ON TIME INTERVAL COUNTER.

## LOG AMPLIFIER (Model 128 only)

| SET: | | |
|---|---|---|
| | RANGE | 1K |
| | MULT | 1.0 |
| | MAIN MODE | RUN |
| | LIN/LOG SW | LIN |

CHECK FOR ±4V AND ±6V ±250mv.

AMP 1 BAL - GROUND TP960 AND ADJUST AMP 1 BAL TO OBTAIN 0V AT TP970. REMOVE JUMPER.

ORIGIN - SET MULT TO S.X. SWITCH TO LOG MODE AND ADJUST ORIGIN TO OBTAIN 2.90V AT TP960.

AMP 2 BAL - GROUND TP960 AND ADJUST AMP 2 BAL FOR 0V AT OUTPUT TERMINAL. REMOVE JUMPER.

LOG MODE TIMING - ADJUST LOG MODE TIMING TO OBTAIN SAME FREQUENCY AS IN LINEAR MODE.

AMP 3 BAL - SET MULT TO S.O (100Hz), LIN/LOG SWITCH TO LOG. ADJUST AMP 3 BAL TO OBTAIN 5mv AT V-f OUTPUT TERMINAL.

# CALIBRATION PROCEDURE

## EQUIPMENT REQUIRED

THE FOLLOWING TEST EQUIPMENT OR SUITABLE EQUIVALENTS OF KNOWN ACCURACY ARE REQUIRED FOR COMPLETE CALIBRATION.

OSCILLOSCOPE - DC TO 50MHz. DIFFERENTIAL PLUG-IN WITH 10mv RESOLUTION.
DISTORTION ANALYZER
VARIABLE TRANSFORMER
VARIABLE REGULATED POWER SUPPLY - 1mv RESOLUTION
FREQUENCY COUNTER/TIME INTERVAL COUNTER
DIFFERENTIAL VOLTMETER - 0.01% ACCURACY

## INITIAL CONTROL SETTINGS

| | |
|---|---|
| POWER SWITCH | ON |
| RANGE | 1K |
| MULTIPLIER | 1.0 |
| MAIN MODE | RUN |
| FUNCTION | ∿ |
| AMPLITUDE | MAX |
| ATTENUATOR | 0db |
| D.C. OFFSET | OFF |
| RAMP MODE | RUN |
| RAMP AMPLITUDE | .9X |
| RAMP POLARITY | NEG |
| RAMP TIME | 1mSEC |

## MAIN GENERATOR

+12V ADJUST - CONNECT VOLTMETER FROM +12V TO GROUND. ADJUST +12V ADJ FOR +12V ±5mv.

-12V ADJUST - CONNECT VOLTMETER FROM -12V TO GROUND. ADJUST -12V ADJ FOR -12V ±5mv.

VCF BALANCE ADJUST - CONNECT FREQUENCY COUNTER TO SYNC OUT JACK. ADJUST VCF BALANCE UNTIL THERE IS NO FREQUENCY SHIFT ON FREQUENCY COUNTER WHEN VCF INPUT IS GROUNDED.

±TRIANGLE PEAK ADJUST - USING DIFFERENTIAL PLUG-IN, ADJUST +TRI PEAK AND -TRI PEAK TO OBTAIN ±1.25V PEAK ±10mv AT TP383.

MAIN TIMING ADJUST - ADJUST MAIN TIMING TO OBTAIN 1KHz ±.5% AT SYNC OUTPUT JACK AS OBSERVED ON FREQUENCY COUNTER.

1000:1 ADJ - SET RANGE TO 100K, MULTIPLIER TO S.O. MONITOR MAIN OUTPUT WITH OSC.AND ADJUST 1000:1 ADJ TO OBTAIN 100Hz TRI AS INDICATED ON FREQ COUNTER.

SEARCH SYMMETRY ADJUST - SET RANGE TO 100K, MULTIPLIER TO S.O. MONITOR MAIN OUTPUT WITH OSC.AND ADJUST SEARCH SYMMETRY TO OBTAIN SYMMETRICAL WAVEFORM. CHECK FOR PROPER ADJUSTMENT USING TIME INTERVAL COUNTER CONNECTED AT THE SYNC OUTPUT JACK.

0.1Hz SYMMETRY ADJUST - SET RANGE TO 1, MULTIPLIER TO .10. CONNECT TIME INTERVAL COUNTER TO SYNC OUTPUT JACK AND ADJUST 0.1Hz SYM FOR CORRECT SYMMETRY ±.5%.

REPEAT 1000:1 ADJUST, SEARCH SYMMETRY AND 0.1Hz SYM ADJ.

1MHz TIMING ADJUST - SET RANGE TO 1M, MULTIPLIER TO 1.0. CONNECT FREQUENCY COUNTER TO SYNC OUTPUT JACK. ADJUST 1MHz TRIMMER TO OBTAIN 1MHz ±1% AS INDICATED ON FREQUENCY COUNTER.

3MHz TIMING ADJUST - SET RANGE TO 3M, MULTIPLIER TO 1.0. CONNECT FREQUENCY COUNTER TO SYNC OUTPUT JACK. ADJUST 3MHz TRIMMER MOUNTED ON RANGE SWITCH TO OBTAIN 3MHz ±1% ON FREQUENCY COUNTER.

±SQUARE AMPLITUDE ADJUST - SET RANGE TO 1K, FUNCTION TO SQUARE. USING DIFFERENTIAL PLUG-IN, ADJUST +SQUARE AMP AND -SQUARE AMP TO OBTAIN ±1.25V PEAK ±10mv SQUARE WAVE AT TP428.

OFFSET ADJUST - SET RANGE TO 1K, MULTIPLIER TO 1.0 AND AMP TO MIN (FULL CCW). MONITOR MAIN OUTPUT WITH OSC.AND ADJUST OFFSET TO OBTAIN MIN.OFFSET WHILE SWITCHING BETWEEN THE NORMAL TRIANGLE AND INVERTED TRIANGLE WITH FUNCTION SWITCH.

H.F. COMP ADJUST - SET RANGE TO 1M, MULTIPLIER TO 1.0, FUNCTION TO SQUARE, AMP TO MAX. TERMINATE THE MAIN OUTPUT INTO 50Ω AND MONITOR WITH OSC. ADJUST H.F. COMP TO OBTAIN OPTIMUM SQUARE WAVE WITH MINIMUM OVERSHOOT.

SINE A, B, C, D ADJUST - SET RANGE TO 10K, MULTIPLIER TO 1.0 AND FUNCTION TO SINE. CONNECT DISTORTION ANALYZER TO MAIN OUTPUT JACK. ADJUST SINE A, B, C AND D TO OBTAIN MIN SINE DISTORTION, TYPICALLY LESS THAN 0.25%.

SINE AMP - SINE D.C. ADJUST - CONNECT DIFFERENTIAL PLUG-IN TO TP560. ADJUST SINE AMP AND SINE D.C. TO OBTAIN ±1.25V PEAK ±10mv.

REPEAT PREVIOUS TWO STEPS DUE TO INTERACTION.

## RAMP GENERATOR

INTERNAL BALANCE ADJUST - SET RAMP MODE TO GATE. CONNECT DIFFERENTIAL VOLTMETER TO TP700 AND ADJUST INTERNAL BALANCE TO OBTAIN 0V ±2mv AT TP700.

LOCKOUT D.C. ADJUST - SET RAMP MODE TO GATE, RAMP POLARITY TO NEG. CONNECT DIFFERENTIAL VOLTMETER TO TP845 AND ADJUST L.O.D.C. TO OBTAIN 0V ±2mv.

+RAMP D.C. ADJUST - SET RAMP POLARITY TO POS. ADJUST +RAMP D.C. TO OBTAIN 0V ±10mv AT TP845.

-RAMP D.C. ADJUST - SET RAMP MODE TO RUN, RAMP TIME TO 1mSEC. ADJUST -RAMP D.C. UNTIL POS PEAK OF RAMP IS 0V ±10mv AT TP751.

RAMP TIMING ADJUST - SET RAMP MODE TO RUN, RAMP TIME TO 1mSEC, VAR TO CAL. CONNECT TIME INTERVAL COUNTER TO RAMP SYNC JACK ON REAR PANEL. MEASURE TIME INTERVAL - TO +. ADJUST RAMP TIMING TO OBTAIN 1mSEC ±1%.

10μSEC ADJUST - SET RAMP TIME TO 10μSEC. ADJUST 10μSEC TRIMMER TO OBTAIN 10μSEC ±2% AS INDICATED ON TIME INTERVAL COUNTER.

## LOG AMPLIFIER (Model 128 only)

| | | |
|---|---|---|
| SET: | RANGE | 1K |
| | MULT | 1.0 |
| | MAIN MODE | RUN |
| | LIN/LOG SW | LIN |

CHECK FOR ±4V AND ±6V ±250mv.

AMP 1 BAL - GROUND TP960 AND ADJUST AMP 1 BAL TO OBTAIN 0V AT TP970. REMOVE JUMPER.

ORIGIN - SET MULT TO S.X. SWITCH TO LOG MODE AND ADJUST ORIGIN TO OBTAIN 2.90V AT TP960.

AMP 2 BAL - GROUND TP960 AND ADJUST AMP 2 BAL FOR 0V AT OUTPUT TERMINAL. REMOVE JUMPER.

LOG MODE TIMING - ADJUST LOG MODE TIMING TO OBTAIN SAME FREQUENCY AS IN LINEAR MODE.

AMP 3 BAL - SET MULT TO S.O (100Hz), LIN/LOG SWITCH TO LOG. ADJUST AMP 3 BAL TO OBTAIN 5mv AT V:f OUTPUT TERMINAL.